

TECHNICAL EDUCATION IN MANCHESTER.

IN no English city is a more sensible or more thorough provision for technical education to be found than in Manchester. Whatever standard of comparison is adopted, be it the number of students under instruction in proportion to the population, the amount of annual expenditure, the number of the schools, or the enthusiasm of its administrators and teachers, Manchester will take one of the foremost places in the educational ranks of the country. In some particulars, indeed, Manchester stands almost alone. In the arrangements which the Technical Instruction Committee of its City Council and its School Board jointly have made to secure the co-ordination of all educational efforts within their borders, and so avoid that over-lapping which is such a prolific source of loss and dis-appointment in many other districts, this centre of the great cotton industry may well serve as an example of a community where the first object of public men is to secure educational efficiency and not to assist the glorification of a particular board or committee.

This success is largely to be attributed to the recognition of the fact that any successful system of technical instruction must be adequately based upon a graduated supply of elementary and secondary education. It is too often imagined that technical education is independent of the work of the public elementary and the grammar schools. But in Manchester it has been for years borne in mind that it is only those youths who have received a thorough preliminary education who reap any advantage from the lectures and laboratory work of the technical school, be it never so perfectly equipped and staffed. The student of education consequently finds, when he endeavours to account for the satisfactory system of technical instruction in Manchester, that, in addition to the ordinary public elementary schools, supplying besides the three R's an elementary introduction to the principles of physics and chemistry, the School Board have provided four higher grade schools, all of them furnished with a "School of Science," and, as readers of NATURE know, the curriculum of schools of this type is eminently suitable as an introductory course for boys and girls who will later proceed to the technical school.

Adequate provision is also made for the children of a higher social status. Manchester is well provided with secondary schools. Its Grammar School and its High School for Girls both deservedly occupy high places among the public schools of the country. Manchester Grammar School, moreover, appears to have been one of the first to teach practical chemistry, for it possessed a small laboratory as long ago as 1868.

There is, too, every facility offered to bright children of the elementary schools to pass forward either to the Higher Grade School or to the Grammar School—this desirable end being secured by a sensible scheme of scholarships. By the same means a vital connection is assured, by way of the secondary schools, between the elementary schools and the Municipal Technical School and the University College.

Nor are the educational needs of youths who have begun the serious business of life neglected. All the schools, to the work of which brief reference has been made, are intended for young people who have as yet entered neither trade nor profession. But in all manufacturing districts the great mass of the workers have to complete their education by well-sustained efforts in evening classes of one kind or another. The authorities in Manchester are fully alive to this fact, and a wonderfully complete system of evening classes has grown up, in which it is interesting to note that the School Board and the Technical Instruction Committee can work together without friction and with the best results. Two sets of these classes are in vogue. First, there are the classes with which the School Board are more directly concerned—the evening continuation schools in which youngsters from twelve to sixteen years of age, who have left the public elementary school for the shop, the warehouse, or the factory, are either preparing themselves for the more advanced classes of the technical school, or are perfecting and continuing the work they did at school with a view to making themselves of greater value to their employers. Secondly, there are the evening classes of the technical school, intended for young men and women of sixteen and upwards, of which it is difficult to give an adequate idea in a few sentences. To really appreciate what is being done in such classes every winter's evening in large manufacturing districts, it is necessary to visit the schools where they are held. The determined efforts the young men and women, who, be it

remembered, have generally spent a laborious day earning their daily bread, will make in order to become acquainted with the principles of science on which their work depends, or to become familiar with the canons of art they hope to apply in designing, is well calculated to inspire the hope that this country will some day take its former position in the industrial contest among the nations.

The students of the Day Technical School and Day School of Art are composed chiefly of the sons of middle class parents. In the majority of cases they do not enter seriously into the work of manufacture and distribution until after completing their studies. It is gratifying to be able to report that there are some exceptions to this rule. Some enterprising employers have made arrangements for sending certain of their employees to the technical school during the day—the employers themselves bearing the expense thereby incurred. It is much to be desired that this far-seeing policy may be more generally adopted. And there are also the scholarship-holders from the higher-grade schools. Such is, in skeleton form, the system of technical education which has been gradually evolved in Manchester. The accompanying pictorial representation gives a bird's eye view of the whole arrangement. The illustration, which was prepared by Mr. J. H. Reynolds, the Director of the Manchester Technical and Art Schools, was awarded a gold medal by the International Jury of the Paris Exhibition.

Another cause of the high state of development of education in Manchester is the broad view which the Technical Instruction Committee have taken of their duties. On at least two separate occasions they have arranged for their Director, with certain members of the committee, to visit foreign countries to study other systems of technical instruction, and on another occasion they have sent him alone to visit the United States. In this way these Manchester authorities have become practically acquainted with German and American ideas of education. They have not endeavoured to follow slavishly such methods in their entirety, but have not hesitated to import notions they considered suitable for the peculiar needs of their own district.

The same committee have also taken a large part in the formation of public opinion in matters educational in Lancashire. At their instigation several conferences have been held of representatives of the numerous county boroughs in their immediate neighbourhood. Resolutions have been adopted and widely circulated urging the need of legislation to ensure that secondary (including technical) education shall be placed under the control of municipal councils, though the desirability of co-opting upon the Educational Committee an effective minority of persons of special experience in all grades of instruction, as well as of encouraging the joint action between the authorities of county boroughs and that of the administrative county have been recognised. But, if they would consider this question more from the national point of view, this enterprising local authority for education might come to a different conclusion. What is the state of affairs in south-east Lancashire? For the sake of example let Manchester be taken as a centre, and consider chiefly the technical education of the district. In this central city there will shortly be, in full working order, a technical school, erected and equipped at a cost of upwards of a quarter of a million, and really provided with accommodation enough for all the advanced technical students which the whole area under consideration could provide. Yet, within easy walking distance, there is the Salford Royal Technical Institute, also admirably organised and generously staffed, and this simply because Salford happens to be a separate borough. The other boroughs of this same area are, moreover, very close together. Stockport, with its own technical school, is within about five miles, and has a splendid train service connecting it with Manchester. Bury, Bolton, Oldham, Rochdale, and other boroughs are sufficiently near for their advanced students to be drafted to Manchester for instruction—the railway fares could easily be provided by means of scholarships. It would certainly seem as though, in the best interests of technical education, an area much larger than that of a county borough is desirable. With boroughs so near as they are in south-east Lancashire there is bound to be duplication and re-duplication of buildings and appliances. To have a school, like the new technical school at Manchester will be, engaged in elementary work, which could be done equally well at much less cost elsewhere, is to lose a grand opportunity of providing one centre at least for advanced technical instruction, of which the country stands in growing need. Experience shows, too, that the same staff cannot successfully undertake to teach crowds of elementary pupils and

also really be of assistance to the comparatively few picked students who will well repay any opportunities placed in their path for advanced study and subsequent research in applied science.

That there is no difficulty in getting students to travel, as has been suggested, is borne out by an appendix to the last report of the Manchester Committee for Technical Instruction. It is there set forth that last year there were, among the 4313 students of the technical school, no fewer than 2266 students from out-districts, of whom 18 came from Bolton, 25 from Bury, 44 from Oldham and Hollinwood, 16 from Rochdale, 348 from Salford, and 43 from Stockport, to name only a few towns from a long list in the report before us.

It is not recognised sufficiently that the technical education this country stands in need of is not elementary instruction in pure science. It has been demonstrated again and again in these columns that such teaching is really a part of every reasonable system of secondary education. When this is fully understood, the large classes in elementary science subjects will disappear from our technical schools. In their place we shall have students at work who, before entering the technical school, have become familiar with the broad principles of physical and chemical science, and who are now in a position to turn their attention to technical science—the application of pure science to the industry with which the student is connected.

Such a policy as has been indicated would make another desirable development possible. A specialisation of function on the part of schools in different towns could then be encouraged where necessary. Given a thoroughly representative authority for a sufficiently large area, and the apparent necessity of a class in every conceivable subject for each borough disappears. Each important technical school will be able to bend its efforts to solving the question of the proper form of technical instruction for one particular industry, or part of an industry. And Manchester, with the large number of great towns in its immediate neighbourhood, is an ideal district in which to begin some such sensible and economical supply of technical education. By all means let us have a generous supply of elementary evening classes in every town, but do let it be borne in mind that this work should only be regarded as preparatory. The serious need is for more centres where advanced students are looked after.

In conclusion, another instance of the enterprise of the Manchester Committee must be mentioned. At the instigation of their Director they have secured for exhibition in Manchester the fine educational collection which the American Government sent to the Paris International Exhibition. Invitations to teachers and others interested in education to come and examine this unique collection of objects are being sent far and wide. It cannot but have a good effect to show English educationists some of the ways in which America is in advance of us in this matter of training intelligent workmen. A. T. SIMMONS.

METHODS OF FORMATION OF HAIL.¹

THERE are many reasons for believing that hailstones are formed in the free atmosphere by some one of several different processes, each of which may be in accord with the laws of thermodynamics:—

(1) An ascending mass of air may be so dry that it does not cool to the dew-point until far below the freezing temperature, in which case the deposit is either fine spiculae of ice or aggregations of these into small snowflakes.

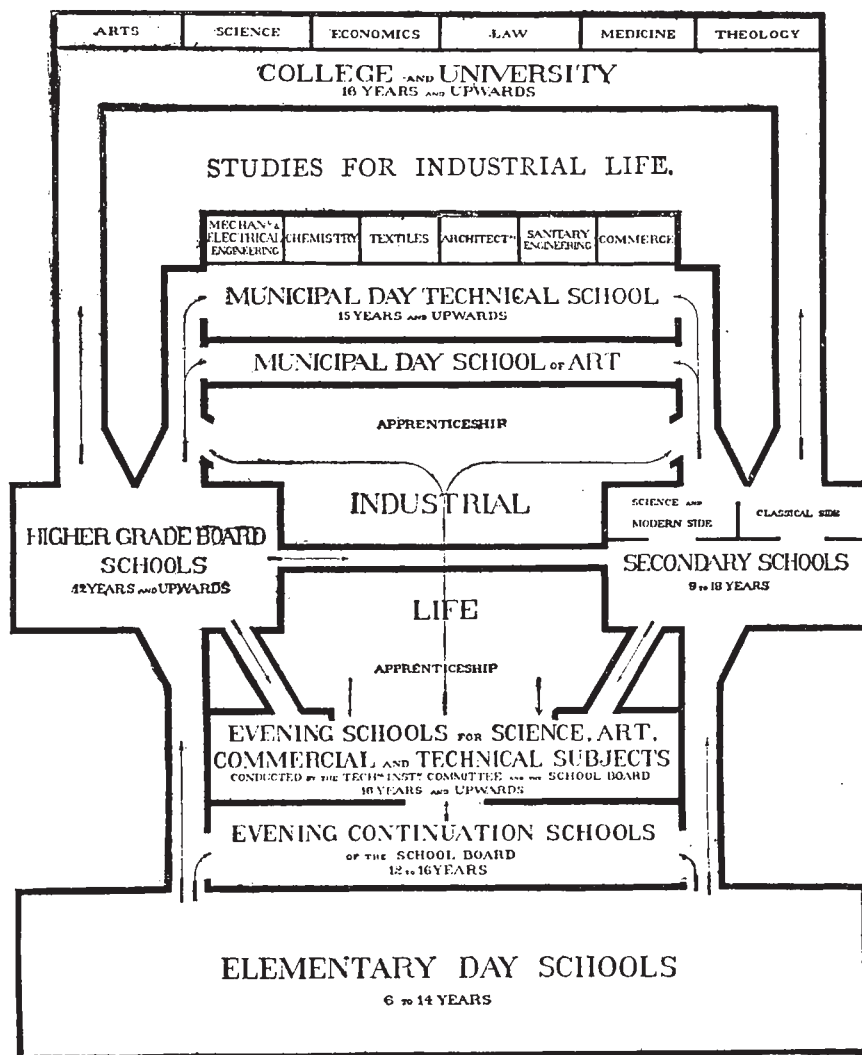


DIAGRAM ILLUSTRATING THE
CORRELATION OF EDUCATION
IN THE
CITY OF MANCHESTER

(2) If the dew-point is a little higher than the preceding, the cloudy condensation may occur at temperatures just above the freezing point, and the watery particles may be carried up a little higher and frozen into what is called frozen fog. These same particles, when driven by the wind against an object, accumulate on it as frostwork.

(3) When a rising mass of air forms a large cumulus cloud at a low level, having a rapidly ascending current in its interior,

¹ Abridged from a contribution by Prof. Cleveland Abbe to the U.S. *Monthly Weather Review*.